Numerical cross section results

The following tables contain the numerical values of the prompt and non-prompt cross section results corrected for detector acceptance (Tables 1 – 4), of the measured non-prompt fractions in the selected J/ψ and ψ(2S) samples (Tables 9 and 10), and of the measured J/ψ to ψ(2S) cross section ratio (Tables 11 and 12).

Tables 13 and 14 give the shifts in the prompt cross section values, with respect to the isotropic decay case, for the four considered polarization scenarios described in the main text.

Tables 5 – 8 contain the prompt and non-prompt cross section values restricted to the CMS muon acceptance regions and uncorrected for detector acceptance, as explained in the text.

Table 1: Absolute prompt J/ψ cross section as a function of $|y|$ and $p_{\rm T}$, corrected for the acceptance as computed in the isotropic decay scenario. The cross section values are expressed in nb/(GeV/c). Statistical and systematic errors are also listed, with the error from luminosity singled out.

p_T (GeV/c)	$< p_T >$ (GeV/c)	$\frac{d^2\sigma}{dp_T dy} \cdot \mathrm{BR} \cdot (1 - f_b)$	$\pm\sigma_{\rm stat}$	$\pm\sigma_{\rm syst}$	$\pm\sigma_{\rm lumi}$
		$0 < \|y\| < 0.9$			
$8.0 - 9.0$	8.569 ± 0.003	2.54	0.07	0.06	0.10
$9.0 - 10.0$	9.515 ± 0.002	1.56	0.03	0.09	0.06
$10.0 - 11.0$	10.494 ± 0.002	0.96	0.02	0.04	0.04
$11.0 - 12.0$	11.485 ± 0.002	0.612	0.012	0.025	0.024
$12.0 - 13.5$	12.711 ± 0.003	0.351	0.006	0.013	0.014
$13.5 - 15.0$	14.206 ± 0.004	0.184	0.004	0.005	0.007
$15.0 - 18.0$	16.329 ± 0.007	0.0841	0.0015	0.0024	0.0034
$18.0 - 30.0$	21.77 ± 0.02	0.0139	0.0002	0.0005	0.0006
$30.0 - 45.0$	35.03 ± 0.08	0.00078	0.00003	0.00003	0.00003
$45.0 - 70.0$	52.7 ± 0.3	0.000070	0.000007	0.000017	0.000003
		$0.9 < \|y\| < 1.2$			
$8.0 - 9.0$	8.524 ± 0.002	2.62	0.08	0.15	0.10
$9.0 - 10.0$	9.491 ± 0.003	1.55	0.05	0.12	0.06
$10.0 - 12.0$	10.921 ± 0.004	0.75	0.02	0.04	0.03
$12.0 - 15.0$	13.312 ± 0.008	0.248	0.006	0.013	0.010
$15.0 - 30.0$	18.95 ± 0.03	0.0264	0.0006	0.0007	0.0011
$30.0 - 45.0$	34.7 ± 0.1	0.00067	0.00006	0.00005	0.00003
		$1.2 < \|y\| < 1.6$			
$6.5 - 7.0$	6.771 ± 0.002	7.09	0.44	0.30	0.28
$7.0 - 7.5$	7.268 ± 0.002	5.28	0.24	0.11	0.21
$7.5 - 8.0$	7.756 ± 0.001	4.16	0.16	0.12	0.17
$8.0 - 8.5$	8.255 ± 0.001	2.92	0.10	0.10	0.12
$8.5 - 9.0$	8.748 ± 0.001	2.24	0.08	0.13	0.09
$9.0 - 10.0$	9.486 ± 0.002	1.47	0.04	0.06	0.06
$10.0 - 11.0$	10.478 ± 0.002	0.84	0.02	0.03	0.03
$11.0 - 12.0$	11.475 ± 0.003	0.528	0.015	0.020	0.021
$12.0 - 15.0$	13.293 ± 0.007	0.227	0.005	0.008	0.009
$15.0 - 30.0$	18.84 ± 0.03	0.0232	0.0005	0.0007	0.0009
$30.0 - 45.0$	34.9 ± 0.1	0.00080	0.00008	0.00006	0.00003
		$1.6 < \|y\| < 2.1$			
$6.5 - 7.0$	6.776 ± 0.002	7.7	0.4	0.4	0.3
$7.0 - 7.25$	7.129 ± 0.001	5.73	0.34	0.30	0.23
$7.25 - 7.5$	7.374 ± 0.001	5.04	0.29	0.27	0.20
$7.5 - 8.0$	7.752 ± 0.001	3.76	0.16	0.22	0.15
$8.0 - 8.5$	8.247 ± 0.002	2.67	0.11	0.13	0.11
$8.5 - 9.0$	8.745 ± 0.002	2.18	0.09	0.09	0.09
$9.0 - 10.0$	9.474 ± 0.003	1.50	0.04	0.06	0.06
$10.0 - 11.0$	10.474 ± 0.003	0.84	0.03	0.04	0.03
$11.0 - 12.0$	11.475 ± 0.003	0.512	0.018	0.025	0.020
$12.0 - 15.0$	13.273 ± 0.008	0.232	0.006	0.011	0.009
$15.0 - 30.0$	18.71 ± 0.04	0.0220	0.0006	0.0009	0.0009
		$2.1 < \|y\| < 2.4$			
$5.5 - 8.0$	7.153 ± 0.008	5.26	0.31	0.28	0.21
$8.0 - 9.0$	8.490 ± 0.006	2.52	0.20	0.16	0.10
$9.0 - 10.0$	9.488 ± 0.006	1.30	0.10	0.11	0.05
$10.0 - 12.0$	10.91 ± 0.01	0.66	0.04	0.07	0.03
$12.0 - 15.0$	13.29 ± 0.01	0.207	0.011	0.017	0.008
$15.0 - 30.0$	18.57 ± 0.08	0.0171	0.0010	0.0013	0.0007

Table 2: Absolute non-prompt J/ψ cross section as a function of $|y|$ and p_{T}, corrected for the acceptance as computed assuming EvtGen polarization. The cross section values are expressed in nb/(GeV/c). Statistical and systematic errors are also listed, with the error from luminosity singled out.

p_T (GeV/c)	$\frac{d^2\sigma}{dp_{\mathrm{T}}dy} \cdot \mathrm{BR} \cdot f_b$	$\pm\sigma_{\mathrm{stat}}$	$\pm\sigma_{\mathrm{syst}}$	$\pm\sigma_{\mathrm{lumi}}$
$0 < \|y\| < 0.9$				
$8.0 - 9.0$	0.946	0.025	0.025	0.038
$9.0 - 10.0$	0.62	0.01	0.04	0.02
$10.0 - 11.0$	0.451	0.009	0.021	0.018
$11.0 - 12.0$	0.322	0.006	0.014	0.013
$12.0 - 13.5$	0.209	0.004	0.008	0.008
$13.5 - 15.0$	0.131	0.003	0.004	0.005
$15.0 - 18.0$	0.0700	0.0013	0.0020	0.0028
$18.0 - 30.0$	0.0160	0.0003	0.0006	0.0006
$30.0 - 45.0$	0.00134	0.00006	0.00005	0.00005
$45.0 - 70.0$	0.00013	0.00001	0.00003	0.00001
$0.9 < \|y\| < 1.2$				
$8.0 - 9.0$	0.94	0.03	0.06	0.04
$9.0 - 10.0$	0.60	0.02	0.05	0.02
$10.0 - 12.0$	0.358	0.008	0.020	0.014
$12.0 - 15.0$	0.152	0.004	0.008	0.006
$15.0 - 30.0$	0.0245	0.0006	0.0006	0.0010
$30.0 - 45.0$	0.00107	0.00009	0.00006	0.00004
$1.2 < \|y\| < 1.6$				
$6.5 - 7.0$	1.85	0.12	0.09	0.07
$7.0 - 7.5$	1.50	0.07	0.05	0.06
$7.5 - 8.0$	1.17	0.04	0.07	0.05
$8.0 - 8.5$	0.91	0.03	0.05	0.04
$8.5 - 9.0$	0.76	0.03	0.05	0.03
$9.0 - 10.0$	0.558	0.014	0.027	0.022
$10.0 - 11.0$	0.357	0.010	0.017	0.014
$11.0 - 12.0$	0.267	0.008	0.012	0.011
$12.0 - 15.0$	0.137	0.003	0.006	0.005
$15.0 - 30.0$	0.0202	0.0004	0.0007	0.0008
$30.0 - 45.0$	0.00113	0.00011	0.00006	0.00005
$1.6 < \|y\| < 2.1$				
$6.5 - 7.0$	1.92	0.10	0.16	0.08
$7.0 - 7.25$	1.67	0.10	0.11	0.07
$7.25 - 7.5$	1.59	0.09	0.10	0.06
$7.5 - 8.0$	1.14	0.05	0.09	0.05
$8.0 - 8.5$	0.83	0.03	0.06	0.03
$8.5 - 9.0$	0.73	0.03	0.05	0.03
$9.0 - 10.0$	0.52	0.02	0.03	0.02
$10.0 - 11.0$	0.357	0.011	0.019	0.014
$11.0 - 12.0$	0.242	0.008	0.016	0.010
$12.0 - 15.0$	0.128	0.003	0.008	0.005
$15.0 - 30.0$	0.0186	0.0005	0.0009	0.0007
$2.1 < \|y\| < 2.4$				
$5.5 - 8.0$	1.43	0.08	0.11	0.06
$8.0 - 9.0$	0.74	0.06	0.08	0.03
$9.0 - 10.0$	0.49	0.04	0.05	0.02
$10.0 - 12.0$	0.27	0.02	0.03	0.01
$12.0 - 15.0$	0.121	0.006	0.011	0.005
$15.0 - 30.0$	0.0131	0.0008	0.0011	0.0005

Table 3: Absolute prompt ψ(2S) cross section as a function of $|y|$ and p_{T}, corrected for the acceptance as computed in the isotropic decay scenario. The cross section values are expressed in nb/(GeV/c). Statistical and systematic errors are also listed, with the error from luminosity singled out.

p_T (GeV/c)	$< p_T >$ (GeV/c)	$\frac{d^2\sigma}{dp_T dy} \cdot \mathrm{BR} \cdot (1 - f_b)$	$\pm\sigma_{\mathrm{stat}}$	$\pm\sigma_{\mathrm{syst}}$	$\pm\sigma_{\mathrm{lumi}}$
$0 < \|y\| < 1.2$					
$6.5 - 8.0$	7.60 ± 0.02	0.148	0.029	0.020	0.006
$8.0 - 9.0$	8.54 ± 0.02	0.083	0.008	0.006	0.003
$9.0 - 10.0$	9.50 ± 0.02	0.061	0.005	0.004	0.002
$10.0 - 11.0$	10.50 ± 0.02	0.0368	0.0031	0.0023	0.0015
$11.0 - 12.0$	11.48 ± 0.02	0.0217	0.0019	0.0022	0.0009
$12.0 - 13.5$	12.72 ± 0.02	0.0141	0.0011	0.0010	0.0006
$13.5 - 15.0$	14.23 ± 0.03	0.0077	0.0007	0.0006	0.0003
$15.0 - 18.0$	16.30 ± 0.05	0.00368	0.00030	0.00017	0.00015
$18.0 - 30.0$	21.92 ± 0.18	0.00066	0.00005	0.00005	0.00003
$1.2 < \|y\| < 1.6$					
$5.5 - 6.5$	6.15 ± 0.04	0.62	0.31	0.05	0.02
$6.5 - 8.0$	7.36 ± 0.03	0.187	0.023	0.005	0.007
$8.0 - 9.0$	8.49 ± 0.02	0.078	0.011	0.005	0.003
$9.0 - 10.0$	9.50 ± 0.02	0.058	0.009	0.006	0.002
$10.0 - 12.0$	10.97 ± 0.03	0.0264	0.0031	0.0020	0.0011
$12.0 - 15.0$	13.32 ± 0.06	0.0109	0.0013	0.0014	0.0004
$15.0 - 30.0$	19.07 ± 0.23	0.00132	0.00013	0.00011	0.00005
$1.6 < \|y\| < 2.4$					
$5.5 - 6.5$	6.20 ± 0.02	0.43	0.15	0.13	0.02
$6.5 - 8.0$	7.25 ± 0.02	0.185	0.031	0.014	0.007
$8.0 - 9.0$	8.48 ± 0.02	0.078	0.011	0.008	0.003
$9.0 - 10.0$	9.52 ± 0.02	0.049	0.008	0.007	0.002
$10.0 - 12.0$	10.88 ± 0.03	0.0219	0.0028	0.0026	0.0009
$12.0 - 15.0$	13.38 ± 0.05	0.0090	0.0011	0.0008	0.0004
$15.0 - 30.0$	19.01 ± 0.23	0.00093	0.00012	0.00008	0.00004

Table 4: Absolute non-prompt $\psi(2S)$ cross section as a function of $|y|$ and p_{T}, corrected for the acceptance as computed assuming EvtGen polarization. The cross section values are expressed in nb/(GeV/c). Statistical and systematic errors are also listed, with the error from luminosity singled out.

p_T (GeV/c)	$\frac{d^2\sigma}{dp_{\mathrm{T}}dy} \cdot \mathrm{BR} \cdot f_b$	$\pm\sigma_{\mathrm{stat}}$	$\pm\sigma_{\mathrm{syst}}$	$\pm\sigma_{\mathrm{lumi}}$
$0 < \|y\| < 1.2$				
$6.5 - 8.0$	0.072	0.014	0.010	0.003
$8.0 - 9.0$	0.045	0.004	0.003	0.002
$9.0 - 10.0$	0.0307	0.0026	0.0026	0.0012
$10.0 - 11.0$	0.0223	0.0019	0.0017	0.0009
$11.0 - 12.0$	0.0142	0.0013	0.0017	0.0006
$12.0 - 13.5$	0.0107	0.0008	0.0008	0.0004
$13.5 - 15.0$	0.0065	0.0006	0.0006	0.0003
$15.0 - 18.0$	0.00350	0.00028	0.00016	0.00014
$18.0 - 30.0$	0.00088	0.00007	0.00006	0.00004
$1.2 < \|y\| < 1.6$				
$5.5 - 6.5$	0.201	0.099	0.027	0.008
$6.5 - 8.0$	0.083	0.010	0.003	0.003
$8.0 - 9.0$	0.035	0.005	0.003	0.001
$9.0 - 10.0$	0.028	0.004	0.004	0.001
$10.0 - 12.0$	0.0152	0.0018	0.0015	0.0006
$12.0 - 15.0$	0.0065	0.0008	0.0009	0.0003
$15.0 - 30.0$	0.00136	0.00013	0.00011	0.00005
$1.6 < \|y\| < 2.4$				
$5.5 - 6.5$	0.12	0.04	0.05	-0.00
$6.5 - 8.0$	0.044	0.007	0.008	0.002
$8.0 - 9.0$	0.033	0.005	0.005	0.001
$9.0 - 10.0$	0.021	0.004	0.004	0.001
$10.0 - 12.0$	0.0129	0.0017	0.0019	0.0005
$12.0 - 15.0$	0.0053	0.0006	0.0005	0.0002
$15.0 - 30.0$	0.00075	0.00010	0.00007	0.00003

Table 5: "Visible" prompt J/ψ cross section as a function of $|y|$ and p_{T}, restricted to the CMS muon acceptance region, and uncorrected for detector acceptance. The cross section values are expressed in nb/(GeV/c). Statistical and systematic errors are also listed, with the error from luminosity singled out.

p_T (GeV/c)	$\langle A_{\mu\mu}\rangle \cdot \frac{d^2\sigma}{dp_{\mathrm{T}}dy} \cdot \mathrm{BR} \cdot (1-f_b)$	$\pm\sigma_{\mathrm{stat}}$	$\pm\sigma_{\mathrm{syst}}$	$\pm\sigma_{\mathrm{lumi}}$
$0 < \|y\| < 0.9$				
$8.0 - 9.0$	0.236	0.006	0.006	0.009
$9.0 - 10.0$	0.291	0.006	0.017	0.012
$10.0 - 11.0$	0.254	0.005	0.012	0.010
$11.0 - 12.0$	0.200	0.004	0.008	0.008
$12.0 - 13.5$	0.138	0.002	0.005	0.006
$13.5 - 15.0$	0.0856	0.0018	0.0025	0.0034
$15.0 - 18.0$	0.0454	0.0008	0.0013	0.0018
$18.0 - 30.0$	0.0093	0.0002	0.0003	0.0004
$30.0 - 45.0$	0.00078	0.00003	0.00003	0.00003
$45.0 - 70.0$	0.000070	0.000007	0.000017	0.000003
$0.9 < \|y\| < 1.2$				
$8.0 - 9.0$	0.396	0.012	0.023	0.016
$9.0 - 10.0$	0.369	0.011	0.029	0.015
$10.0 - 12.0$	0.254	0.006	0.013	0.010
$12.0 - 15.0$	0.117	0.003	0.006	0.005
$15.0 - 30.0$	0.0168	0.0004	0.0004	0.0007
$30.0 - 45.0$	0.00067	0.00006	0.00005	0.00003
$1.2 < \|y\| < 1.6$				
$6.5 - 7.0$	0.268	0.017	0.011	0.011
$7.0 - 7.5$	0.377	0.017	0.008	0.015
$7.5 - 8.0$	0.546	0.021	0.016	0.022
$8.0 - 8.5$	0.539	0.019	0.019	0.022
$8.5 - 9.0$	0.51	0.02	0.03	0.02
$9.0 - 10.0$	0.429	0.011	0.017	0.017
$10.0 - 11.0$	0.308	0.008	0.012	0.012
$11.0 - 12.0$	0.221	0.006	0.008	0.009
$12.0 - 15.0$	0.116	0.002	0.004	0.005
$15.0 - 30.0$	0.0155	0.0003	0.0005	0.0006
$30.0 - 45.0$	0.00080	0.00008	0.00006	0.00003
$1.6 < \|y\| < 2.1$				
$6.5 - 7.0$	0.464	0.025	0.026	0.019
$7.0 - 7.25$	0.58	0.04	0.03	0.02
$7.25 - 7.5$	0.62	0.04	0.03	0.02
$7.5 - 8.0$	0.63	0.03	0.04	0.03
$8.0 - 8.5$	0.61	0.02	0.03	0.02
$8.5 - 9.0$	0.576	0.023	0.023	0.023
$9.0 - 10.0$	0.466	0.014	0.020	0.019
$10.0 - 11.0$	0.314	0.010	0.014	0.013
$11.0 - 12.0$	0.222	0.008	0.010	0.009
$12.0 - 15.0$	0.118	0.003	0.005	0.005
$15.0 - 30.0$	0.0148	0.0004	0.0006	0.0006
$2.1 < \|y\| < 2.4$				
$5.5 - 8.0$	0.121	0.007	0.006	0.005
$8.0 - 9.0$	0.194	0.015	0.012	0.008
$9.0 - 10.0$	0.160	0.012	0.013	0.006
$10.0 - 12.0$	0.114	0.007	0.012	0.005
$12.0 - 15.0$	0.055	0.003	0.004	0.002
$15.0 - 30.0$	0.0077	0.0005	0.0006	0.0003

Table 6: "Visible" non-prompt J/ψ cross section as a function of $|y|$ and p_{T}, restricted to the CMS muon acceptance region, and uncorrected for detector acceptance. The cross section values are expressed in nb/(GeV/c). Statistical and systematic errors are also listed, with the error from luminosity singled out.

p_T (GeV/c)	$\langle A_{\mu\mu}\rangle \cdot \frac{d^2\sigma}{dp_T dy} \cdot \mathrm{BR} \cdot f_b$	$\pm\sigma_{\mathrm{stat}}$	$\pm\sigma_{\mathrm{syst}}$	$\pm\sigma_{\mathrm{lumi}}$
$0 < \|y\| < 0.9$				
$8.0 - 9.0$	0.0877	0.0023	0.0023	0.0035
$9.0 - 10.0$	0.116	0.002	0.007	0.005
$10.0 - 11.0$	0.119	0.002	0.006	0.005
$11.0 - 12.0$	0.105	0.002	0.005	0.004
$12.0 - 13.5$	0.082	0.001	0.003	0.003
$13.5 - 15.0$	0.0612	0.0013	0.0018	0.0024
$15.0 - 18.0$	0.0378	0.0007	0.0011	0.0015
$18.0 - 30.0$	0.0107	0.0002	0.0004	0.0004
$30.0 - 45.0$	0.00134	0.00006	0.00005	0.00005
$45.0 - 70.0$	0.00013	0.00001	0.00003	0.00001
$0.9 < \|y\| < 1.2$				
$8.0 - 9.0$	0.142	0.004	0.009	0.006
$9.0 - 10.0$	0.144	0.004	0.012	0.006
$10.0 - 12.0$	0.122	0.003	0.007	0.005
$12.0 - 15.0$	0.071	0.002	0.004	0.003
$15.0 - 30.0$	0.0155	0.0004	0.0004	0.0006
$30.0 - 45.0$	0.00107	0.00009	0.00006	0.00004
$1.2 < \|y\| < 1.6$				
$6.5 - 7.0$	0.070	0.004	0.004	0.003
$7.0 - 7.5$	0.107	0.005	0.004	0.004
$7.5 - 8.0$	0.153	0.006	0.009	0.006
$8.0 - 8.5$	0.169	0.006	0.009	0.007
$8.5 - 9.0$	0.172	0.006	0.012	0.007
$9.0 - 10.0$	0.162	0.004	0.008	0.006
$10.0 - 11.0$	0.132	0.004	0.006	0.005
$11.0 - 12.0$	0.112	0.003	0.005	0.004
$12.0 - 15.0$	0.0697	0.0014	0.0028	0.0028
$15.0 - 30.0$	0.0135	0.0003	0.0005	0.0005
$30.0 - 45.0$	0.00113	0.00011	0.00006	0.00005
$1.6 < \|y\| < 2.1$				
$6.5 - 7.0$	0.115	0.006	0.010	0.005
$7.0 - 7.25$	0.170	0.010	0.011	0.007
$7.25 - 7.5$	0.196	0.011	0.013	0.008
$7.5 - 8.0$	0.193	0.008	0.015	0.008
$8.0 - 8.5$	0.191	0.008	0.015	0.008
$8.5 - 9.0$	0.192	0.008	0.013	0.008
$9.0 - 10.0$	0.162	0.005	0.011	0.006
$10.0 - 11.0$	0.134	0.004	0.007	0.005
$11.0 - 12.0$	0.105	0.004	0.007	0.004
$12.0 - 15.0$	0.065	0.002	0.004	0.003
$15.0 - 30.0$	0.0125	0.0003	0.0006	0.0005
$2.1 < \|y\| < 2.4$				
$5.5 - 8.0$	0.0330	0.0019	0.0026	0.0013
$8.0 - 9.0$	0.057	0.004	0.006	0.002
$9.0 - 10.0$	0.061	0.005	0.006	0.002
$10.0 - 12.0$	0.047	0.003	0.005	0.002
$12.0 - 15.0$	0.0320	0.0017	0.0026	0.0013
$15.0 - 30.0$	0.0058	0.0003	0.0005	0.0002

Table 7: "Visible" prompt ψ(2S) cross section as a function of $|y|$ and p_{T}, restricted to the CMS muon acceptance region, and uncorrected for detector acceptance. The cross section values are expressed in nb/(GeV/c). Statistical and systematic errors are also listed, with the error from luminosity singled out.

p_T (GeV/c)	$\langle A_{\mu\mu}\rangle \cdot \frac{d^2\sigma}{dp_{\mathrm{T}}dy} \cdot \mathrm{BR} \cdot (1-f_b)$	$\pm\sigma_{\mathrm{stat}}$	$\pm\sigma_{\mathrm{syst}}$	$\pm\sigma_{\mathrm{lumi}}$
$0 < \|y\| < 1.2$				
$6.5 - 8.0$	0.0039	0.0008	0.0005	0.0002
$8.0 - 9.0$	0.0098	0.0010	0.0007	0.0004
$9.0 - 10.0$	0.0127	0.0011	0.0008	0.0005
$10.0 - 11.0$	0.0104	0.0009	0.0007	0.0004
$11.0 - 12.0$	0.0075	0.0007	0.0008	0.0003
$12.0 - 13.5$	0.0059	0.0004	0.0004	0.0002
$13.5 - 15.0$	0.0036	0.0003	0.0003	0.0001
$15.0 - 18.0$	0.00202	0.00016	0.00009	0.00008
$18.0 - 30.0$	0.00043	0.00003	0.00003	0.00002
$1.2 < \|y\| < 1.6$				
$5.5 - 6.5$	0.0109	0.0054	0.0008	0.0004
$6.5 - 8.0$	0.0154	0.0019	0.0004	0.0006
$8.0 - 9.0$	0.0163	0.0023	0.0010	0.0007
$9.0 - 10.0$	0.0167	0.0025	0.0016	0.0007
$10.0 - 12.0$	0.0103	0.0012	0.0008	0.0004
$12.0 - 15.0$	0.0055	0.0006	0.0007	0.0002
$15.0 - 30.0$	0.00088	0.00009	0.00008	0.00004
$1.6 < \|y\| < 2.4$				
$5.5 - 6.5$	0.0068	0.0024	0.0020	0.0003
$6.5 - 8.0$	0.0157	0.0026	0.0011	0.0006
$8.0 - 9.0$	0.0134	0.0019	0.0013	0.0005
$9.0 - 10.0$	0.0115	0.0020	0.0017	0.0005
$10.0 - 12.0$	0.0073	0.0009	0.0009	0.0003
$12.0 - 15.0$	0.0039	0.0005	0.0003	0.0002
$15.0 - 30.0$	0.00055	0.00007	0.00005	0.00002

Table 8: "Visible" non-prompt ψ(2S) cross section as a function of $|y|$ and p_{T}, restricted to the CMS muon acceptance region, and uncorrected for detector acceptance. The cross section values are expressed in nb/(GeV/c). Statistical and systematic errors are also listed, with the error from luminosity singled out.

p_T (GeV/c)	$\langle A_{\mu\mu}\rangle \cdot \frac{d^2\sigma}{dp_{\mathrm{T}}dy} \cdot \mathrm{BR} \cdot f_b$	$\pm\sigma_{\mathrm{stat}}$	$\pm\sigma_{\mathrm{syst}}$	$\pm\sigma_{\mathrm{lumi}}$
$0 < \|y\| < 1.2$				
$6.5 - 8.0$	0.00188	0.00036	0.00026	0.00008
$8.0 - 9.0$	0.0053	0.0005	0.0004	0.0002
$9.0 - 10.0$	0.0064	0.0005	0.0005	0.0003
$10.0 - 11.0$	0.0063	0.0005	0.0005	0.0003
$11.0 - 12.0$	0.0049	0.0004	0.0006	0.0002
$12.0 - 13.5$	0.0044	0.0003	0.0003	0.0002
$13.5 - 15.0$	0.00304	0.00027	0.00027	0.00012
$15.0 - 18.0$	0.00192	0.00015	0.00009	0.00008
$18.0 - 30.0$	0.00058	0.00004	0.00003	0.00002
$1.2 < \|y\| < 1.6$				
$5.5 - 6.5$	0.0036	0.0018	0.0005	0.0001
$6.5 - 8.0$	0.00687	0.00085	0.00028	0.00027
$8.0 - 9.0$	0.0073	0.0010	0.0007	0.0003
$9.0 - 10.0$	0.0080	0.0012	0.0011	0.0003
$10.0 - 12.0$	0.0060	0.0007	0.0006	0.0002
$12.0 - 15.0$	0.0033	0.0004	0.0005	0.0001
$15.0 - 30.0$	0.00092	0.00009	0.00008	0.00004
$1.6 < \|y\| < 2.4$				
$5.5 - 6.5$	0.0018	0.0007	0.0008	0.0001
$6.5 - 8.0$	0.0038	0.0006	0.0006	0.0002
$8.0 - 9.0$	0.0057	0.0008	0.0008	0.0002
$9.0 - 10.0$	0.0049	0.0008	0.0010	0.0002
$10.0 - 12.0$	0.0043	0.0006	0.0006	0.0002
$12.0 - 15.0$	0.00230	0.00027	0.00022	0.00009
$15.0 - 30.0$	0.00044	0.00006	0.00004	0.00002

Table 9: Fraction of J/ψ from b hadrons in p_{T} and $|y|$ bins. The b-fraction column lists the statistical and systematic uncertainties.

$\lvert y\rvert$	p_T (GeV/c)	$f_B(J/\psi)$
$0.0-0.9$	$8.0-9.0$	$0.271 \pm 0.006 \pm 0.003$
	$9.0-10.0$	$0.285 \pm 0.005 \pm 0.004$
	$10.0-11.0$	$0.320 \pm 0.005 \pm 0.004$
	$11.0-12.0$	$0.345 \pm 0.005 \pm 0.007$
	$12.0-13.5$	$0.373 \pm 0.005 \pm 0.003$
	$13.5-15.0$	$0.417 \pm 0.006 \pm 0.005$
	$15.0-18.0$	$0.454 \pm 0.006 \pm 0.004$
	$18.0-30.0$	$0.535 \pm 0.006 \pm 0.004$
	$30.0-45.0$	$0.633 \pm 0.015 \pm 0.010$
	$45.0-70.0$	$0.646 \pm 0.038 \pm 0.024$
$0.9-1.2$	$8.0-9.0$	$0.265 \pm 0.007 \pm 0.007$
	$9.0-10.0$	$0.281 \pm 0.007 \pm 0.007$
	$10.0-12.0$	$0.324 \pm 0.006 \pm 0.007$
	$12.0-15.0$	$0.380 \pm 0.006 \pm 0.008$
	$15.0-30.0$	$0.481 \pm 0.007 \pm 0.007$
	$30.0-45.0$	$0.616 \pm 0.029 \pm 0.028$
$1.2-1.6$	$6.5-7.0$	$0.207 \pm 0.010 \pm 0.006$
	$7.0-7.5$	$0.221 \pm 0.009 \pm 0.006$
	$7.5-8.0$	$0.219 \pm 0.007 \pm 0.012$
	$8.0-8.5$	$0.238 \pm 0.007 \pm 0.011$
	$8.5-9.0$	$0.253 \pm 0.007 \pm 0.009$
	$9.0-10.0$	$0.275 \pm 0.006 \pm 0.008$
	$10.0-11.0$	$0.299 \pm 0.006 \pm 0.009$
	$11.0-12.0$	$0.335 \pm 0.007 \pm 0.009$
	$12.0-15.0$	$0.376 \pm 0.006 \pm 0.011$
	$15.0-30.0$	$0.466 \pm 0.007 \pm 0.013$
	$30.0-45.0$	$0.583 \pm 0.026 \pm 0.024$
$1.6-2.1$	$6.50-7.00$	$0.199 \pm 0.010 \pm 0.012$
	$7.00-7.25$	$0.225 \pm 0.013 \pm 0.010$
	$7.25-7.50$	$0.239 \pm 0.013 \pm 0.010$
	$7.50-8.00$	$0.233 \pm 0.009 \pm 0.013$
	$8.00-8.50$	$0.237 \pm 0.009 \pm 0.015$
	$8.50-9.00$	$0.250 \pm 0.009 \pm 0.014$
	$9.00-10.00$	$0.258 \pm 0.007 \pm 0.014$
	$10.00-11.00$	$0.299 \pm 0.008 \pm 0.010$
	$11.00-12.00$	$0.321 \pm 0.010 \pm 0.015$
	$12.00-15.00$	$0.356 \pm 0.008 \pm 0.017$
	$15.00-30.00$	$0.458 \pm 0.009 \pm 0.019$
$2.1-2.4$	$5.5-8.0$	$0.214 \pm 0.012 \pm 0.013$
	$8.0-9.0$	$0.226 \pm 0.016 \pm 0.020$
	$9.0-10.0$	$0.275 \pm 0.018 \pm 0.020$
	$10.0-12.0$	$0.294 \pm 0.014 \pm 0.018$
	$12.0-15.0$	$0.368 \pm 0.016 \pm 0.017$
	$15.0-30.0$	$0.432 \pm 0.020 \pm 0.023$

Table 10: Fraction of ψ(2S) from b hadrons in $p_{\rm T}$ and $|y|$ bins. The b-fraction column lists the statistical and systematic uncertainties; the ψ(2S) to J/ψ b-fraction ratio is also shown.

$\lvert y\rvert$	p_T (GeV/c)	$f_B(\psi(2S))$	$f_B(\psi(2S))/f_B(J/\psi)$
$0.0-1.2$	$6.5-8.0$	$0.326 \pm 0.041 \pm 0.011$	$1.46 \pm 0.19 \pm 0.08$
	$8.0-9.0$	$0.350 \pm 0.025 \pm 0.014$	$1.30 \pm 0.12 \pm 0.08$
	$9.0-10.0$	$0.335 \pm 0.021 \pm 0.020$	$1.20 \pm 0.08 \pm 0.08$
	$10.0-11.0$	$0.378 \pm 0.023 \pm 0.022$	$1.19 \pm 0.08 \pm 0.07$
	$11.0-12.0$	$0.394 \pm 0.024 \pm 0.028$	$1.16 \pm 0.07 \pm 0.09$
	$12.0-13.5$	$0.431 \pm 0.022 \pm 0.020$	$1.16 \pm 0.06 \pm 0.05$
	$13.5-15.0$	$0.456 \pm 0.025 \pm 0.028$	$1.10 \pm 0.06 \pm 0.07$
	$15.0-18.0$	$0.487 \pm 0.024 \pm 0.017$	$1.08 \pm 0.05 \pm 0.04$
	$18.0-30.0$	$0.572 \pm 0.025 \pm 0.028$	$1.08 \pm 0.05 \pm 0.05$
$1.2-1.6$	$5.5-6.5$	$0.246 \pm 0.093 \pm 0.029$	$1.33 \pm 0.51 \pm 0.22$
	$6.5-8.0$	$0.308 \pm 0.030 \pm 0.010$	$1.42 \pm 0.14 \pm 0.07$
	$8.0-9.0$	$0.309 \pm 0.035 \pm 0.022$	$1.26 \pm 0.14 \pm 0.11$
	$9.0-10.0$	$0.32 \pm 0.03 \pm 0.04$	$1.18 \pm 0.12 \pm 0.14$
	$10.0-12.0$	$0.366 \pm 0.029 \pm 0.028$	$1.16 \pm 0.09 \pm 0.09$
	$12.0-15.0$	$0.375 \pm 0.032 \pm 0.028$	$1.00 \pm 0.09 \pm 0.07$
	$15.0-30.0$	$0.51 \pm 0.03 \pm 0.04$	$1.09 \pm 0.07 \pm 0.08$
$1.6-2.4$	$5.5-6.5$	$0.21 \pm 0.06 \pm 0.07$	$1.2 \pm 0.3 \pm 0.3$
	$6.5-8.0$	$0.19 \pm 0.03 \pm 0.03$	$0.88 \pm 0.13 \pm 0.13$
	$8.0-9.0$	$0.30 \pm 0.04 \pm 0.04$	$1.24 \pm 0.15 \pm 0.18$
	$9.0-10.0$	$0.30 \pm 0.04 \pm 0.05$	$1.14 \pm 0.17 \pm 0.19$
	$10.0-12.0$	$0.37 \pm 0.03 \pm 0.04$	$1.23 \pm 0.11 \pm 0.14$
	$12.0-15.0$	$0.372 \pm 0.035 \pm 0.015$	$1.04 \pm 0.10 \pm 0.07$
	$15.0-30.0$	$0.45 \pm 0.04 \pm 0.04$	$0.97 \pm 0.09 \pm 0.07$

Table 11: Prompt ψ(2S) to J/ψ cross section ratio as a function of $|y|$ and $p_{\rm T}$, assuming isotropic decay. The uncertainties are statistical, systematic and from polarization (see main text).

p_T (GeV/c)	$\frac{d^2\sigma}{dp_{\rm T}dy}(\psi(2S))\cdot BR_{(\psi(2S)\to\mu^+\mu^-)}$ / $\frac{d^2\sigma}{dp_{\rm T}dy}(J/\psi)\cdot BR_{(J/\psi\to\mu^+\mu^-)}$	$\pm\sigma_{\rm stat}$	$\pm\sigma_{\rm syst}$	$\pm\sigma_{\rm pol}$
	$\lvert y\rvert < 1.2$			
$8-9$	0.0308	0.0014	0.0018	$^{+0.005}_{-0.006}$
$9-10$	0.0370	0.0015	0.0019	$^{+0.006}_{-0.006}$
$10-11$	0.0351	0.0015	0.0015	$^{+0.006}_{-0.006}$
$11-12$	0.0369	0.0017	0.0015	$^{+0.007}_{-0.007}$
$12-13$	0.0408	0.0016	0.0018	$^{+0.006}_{-0.007}$
$13-15$	0.0442	0.0021	0.0018	$^{+0.007}_{-0.008}$
$15-18$	0.0415	0.0019	0.0017	$^{+0.005}_{-0.007}$
$18-30$	0.0462	0.0021	0.0026	$^{+0.005}_{-0.007}$
	$1.2 < \lvert y\rvert < 1.6$			
$6.5-8$	0.040	0.002	0.006	$^{+0.006}_{-0.006}$
$8-9$	0.033	0.002	0.005	$^{+0.006}_{-0.005}$
$9-10$	0.041	0.003	0.006	$^{+0.006}_{-0.007}$
$10-12$	0.039	0.003	0.006	$^{+0.005}_{-0.007}$
$12-15$	0.054	0.005	0.010	$^{+0.008}_{-0.008}$
$15-30$	0.055	0.003	0.008	$^{+0.006}_{-0.008}$
	$1.6 < \lvert y\rvert < 2.4$			
$6.5-8$	0.039	0.003	0.003	$^{+0.005}_{-0.007}$
$8-9$	0.0302	0.0024	0.0018	$^{+0.005}_{-0.006}$
$9-10$	0.040	0.004	0.004	$^{+0.006}_{-0.007}$
$10-12$	0.0317	0.0023	0.0019	$^{+0.005}_{-0.006}$
$12-15$	0.0406	0.0028	0.0023	$^{+0.005}_{-0.007}$
$15-30$	0.0443	0.0038	0.0020	$^{+0.005}_{-0.008}$
	Integrated: $\lvert y\rvert < 2.4$			
$6.5-8$	0.0358	0.0017	0.0039	$^{+0.006}_{-0.007}$
$8-9$	0.0323	0.0013	0.0024	$^{+0.005}_{-0.006}$
$9-10$	0.0367	0.0016	0.0027	$^{+0.006}_{-0.006}$
$10-12$	0.0355	0.0010	0.0026	$^{+0.006}_{-0.006}$
$12-15$	0.0422	0.0013	0.0032	$^{+0.006}_{-0.008}$
$15-30$	0.0441	0.0013	0.0035	$^{+0.005}_{-0.007}$

Table 12: Non-prompt ψ(2S) to J/ψ cross section ratio as a function of $|y|$ and p_{T}, assuming the same EvtGen polarization. The uncertainties are statistical and systematic.

p_T (GeV/c)	$\frac{d^2\sigma}{dp_{\mathrm{T}}dy}(\psi(2\mathrm{S}))\cdot\mathrm{BR}(\psi(2\mathrm{S})\to\mu^+\mu^-)$ / $\frac{d^2\sigma}{dp_{\mathrm{T}}dy}(J/\psi)\cdot\mathrm{BR}(J/\psi\to\mu^+\mu^-)$	$\pm\sigma_{\mathrm{stat}}$	$\pm\sigma_{\mathrm{syst}}$
$\|y\| < 1.2$			
$8-9$	0.0480	0.0022	0.0028
$9-10$	0.0483	0.0019	0.0024
$10-11$	0.0452	0.0019	0.0020
$11-12$	0.0466	0.0021	0.0019
$12-13$	0.0519	0.0021	0.0023
$13-15$	0.0527	0.0025	0.0021
$15-18$	0.0475	0.0022	0.0019
$18-30$	0.054	0.002	0.003
$1.2 < \|y\| < 1.6$			
$6.5-8$	0.054	0.003	0.008
$8-9$	0.042	0.003	0.006
$9-10$	0.047	0.004	0.007
$10-12$	0.047	0.003	0.007
$12-15$	0.049	0.005	0.009
$15-30$	0.063	0.003	0.009
$1.6 < \|y\| < 2.4$			
$6.5-8$	0.0318	0.0023	0.0029
$8-9$	0.0435	0.0034	0.0027
$9-10$	0.042	0.004	0.004
$10-12$	0.0468	0.0034	0.0029
$12-15$	0.0446	0.0031	0.0025
$15-30$	0.0451	0.0039	0.0021
Integrated: $\|y\| < 2.4$			
$6.5-8$	0.0390	0.0031	0.0052
$8-9$	0.0455	0.0026	0.0033
$9-10$	0.0470	0.0032	0.0034
$10-12$	0.0460	0.0022	0.0033
$12-15$	0.0504	0.0022	0.0033
$15-30$	0.0499	0.0020	0.0040

Table 13: Prompt J/ψ cross sections as a function of y and p_T, assuming four polarization scenarios, namely: fully longitudinal in the Collins-Soper frame (CS_L) ; fully transverse in the Collins-Soper frame (CS_T); fully longitudinal in the helicity frame (HX_L); fully trasverse in the helicity frame (HX_L). The results are expressed as a difference with respect to the values measured assuming null-polarization and listed in tables above, and are expressed in nb/(GeV/c).

p_T (GeV/c)	$\Delta\sigma(CS_L)$	$\Delta\sigma(CS_T)$	$\Delta\sigma(HX_L)$	$\Delta\sigma(HX_T)$
$0 < \|y\| < 0.9$				
$8.0 - 9.0$	0.21	-0.06	-0.62	0.58
$9.0 - 10.0$	0.22	-0.06	-0.37	0.31
$10.0 - 11.0$	0.155	-0.049	-0.213	0.170
$11.0 - 12.0$	0.085	-0.031	-0.127	0.087
$12.0 - 13.5$	0.037	-0.013	-0.065	0.050
$13.5 - 15.0$	0.022	-0.008	-0.030	0.020
$15.0 - 18.0$	0.0066	-0.0027	-0.0124	0.0080
$18.0 - 30.0$	0.0009	-0.0003	-0.0015	0.0008
$30.0 - 45.0$	0	0	0	0
$45.0 - 70.0$	0	0	0	0
$0.9 < \|y\| < 1.2$				
$8.0 - 9.0$	0.64	-0.21	-0.61	0.62
$9.0 - 10.0$	0.26	-0.11	-0.36	0.28
$10.0 - 12.0$	0.109	-0.040	-0.156	0.134
$12.0 - 15.0$	0.033	-0.011	-0.040	0.028
$15.0 - 30.0$	0.0019	-0.0008	-0.0034	0.0019
$30.0 - 45.0$	0	0	0	0
$1.2 < \|y\| < 1.6$				
$6.5 - 7.0$	-1.46	1.06	-1.90	2.13
$7.0 - 7.5$	-0.56	0.34	-1.25	1.19
$7.5 - 8.0$	-0.04	-0.03	-1.05	0.71
$8.0 - 8.5$	0.19	-0.01	-0.70	0.52
$8.5 - 9.0$	0.24	-0.06	-0.51	0.38
$9.0 - 10.0$	0.18	-0.07	-0.33	0.27
$10.0 - 11.0$	0.095	-0.030	-0.174	0.138
$11.0 - 12.0$	0.048	-0.029	-0.104	0.075
$12.0 - 15.0$	0.023	-0.008	-0.039	0.025
$15.0 - 30.0$	0.0012	-0.0007	-0.0026	0.0017
$30.0 - 45.0$	0	0	0	0
$1.6 < \|y\| < 2.1$				
$6.5 - 7.0$	-0.17	0.18	-2.22	2.26
$7.0 - 7.25$	0.71	0.09	-1.54	1.33
$7.25 - 7.5$	0.77	-0.23	-1.19	1.01
$7.5 - 8.0$	0.57	-0.13	-0.98	0.70
$8.0 - 8.5$	0.51	-0.14	-0.69	0.55
$8.5 - 9.0$	0.43	-0.12	-0.53	0.44
$9.0 - 10.0$	0.23	-0.08	-0.33	0.26
$10.0 - 11.0$	0.118	-0.056	-0.182	0.144
$11.0 - 12.0$	0.065	-0.023	-0.105	0.066
$12.0 - 15.0$	0.038	-0.011	-0.044	0.032
$15.0 - 30.0$	0.0023	-0.0009	-0.0030	0.0015
$2.1 < \|y\| < 2.4$				
$5.5 - 8.0$	-0.98	1.65	-1.65	3.36
$8.0 - 9.0$	-0.20	0.58	-0.67	0.76
$9.0 - 10.0$	-0.10	0.21	-0.27	0.31
$10.0 - 12.0$	-0.060	0.124	-0.163	0.096
$12.0 - 15.0$	-0.002	0.020	-0.022	0.019
$15.0 - 30.0$	-0.0009	0.0003	-0.0023	0.0011

Table 14: Prompt ψ(2S) cross sections as a function of y and p_T, assuming four polarization scenarios, namely: fully longitudinal in the Collins-Soper frame (CS_L) ; fully transverse in the Collins-Soper frame (CS_T); fully longitudinal in the helicity frame (HX_L); fully trasverse in the helicity frame (HX_L). The results are expressed as a difference with respect to the values measured assuming null-polarization and listed in tables above, and are expressed in nb/(GeV/c).

p_T (GeV/c)	$\Delta\sigma(CS_L)$	$\Delta\sigma(CS_T)$	$\Delta\sigma(HX_L)$	$\Delta\sigma(HX_T)$
$0 < \|y\| < 1.2$				
$6.5 - 8.0$	-0.007	0.006	-0.046	0.050
$8.0 - 9.0$	0.0112	-0.0035	-0.0262	0.0245
$9.0 - 10.0$	0.0125	-0.0047	-0.0182	0.0163
$10.0 - 11.0$	0.0080	-0.0032	-0.0108	0.0095
$11.0 - 12.0$	0.0049	-0.0019	-0.0062	0.0057
$12.0 - 13.5$	0.0030	-0.0011	-0.0039	0.0033
$13.5 - 15.0$	0.00171	-0.00056	-0.00203	0.00169
$15.0 - 18.0$	0.00065	-0.00025	-0.00089	0.00069
$18.0 - 30.0$	0.000096	-0.000037	-0.000133	0.000097
$1.2 < \|y\| < 1.6$				
$5.5 - 6.5$	-0.185	0.150	-0.196	0.177
$6.5 - 8.0$	-0.029	0.022	-0.056	0.056
$8.0 - 9.0$	0.0076	-0.0032	-0.0228	0.0211
$9.0 - 10.0$	0.0085	-0.0032	-0.0163	0.0145
$10.0 - 12.0$	0.0047	-0.0020	-0.0073	0.0064
$12.0 - 15.0$	0.0018	-0.0007	-0.0027	0.0023
$15.0 - 30.0$	0.00018	-0.00008	-0.00027	0.00019
$1.6 < \|y\| < 2.4$				
$5.5 - 6.5$	-0.122	0.130	-0.157	0.157
$6.5 - 8.0$	-0.016	0.021	-0.063	0.053
$8.0 - 9.0$	0.0026	0.0029	-0.0260	0.0235
$9.0 - 10.0$	0.0047	0.0014	-0.0154	0.0143
$10.0 - 12.0$	0.0028	-0.0006	-0.0065	0.0052
$12.0 - 15.0$	0.00110	-0.00026	-0.00243	0.00177
$15.0 - 30.0$	0.000100	-0.000031	-0.000210	0.000143